

# High Performance Ka-band Phase Shifters for Space Telecommunications, Phase I

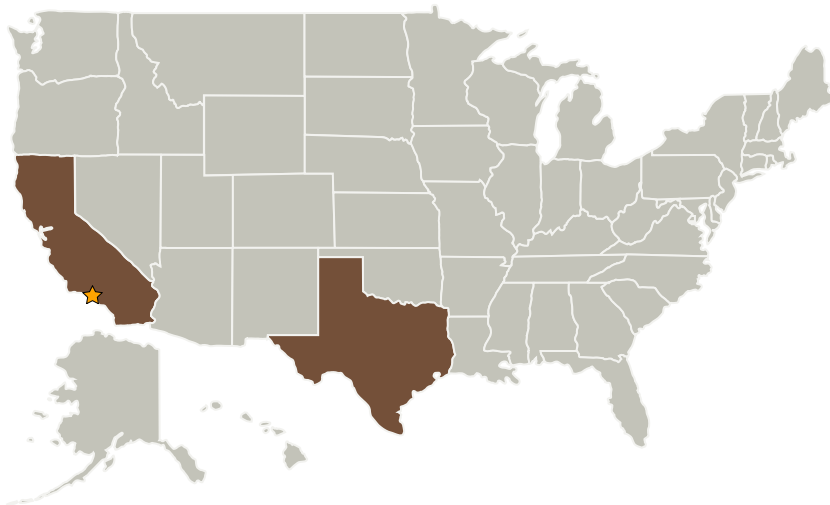
Completed Technology Project (2008 - 2009)



## Project Introduction

We propose a novel MEMS-based digital phase shifter targeted for Ka-band operation, but scalable down to X-band and up to W-band. This novel phase shifter will incorporate MEMtronics' state-of-the-art microencapsulated, capacitive MEMS switches to control phase. The envisioned phase shifter behaves much like a switched-line phase shifter with broadband matched impedance, but without sacrificing size normally needed to accommodate multiple signal paths. Many MEMS-based phase shifters have been created with good results utilizing a loaded line approach. While this technique works well for smaller bits, larger bits suffer from narrow bandwidths and a poor impedance match in one or both states. Additionally, cascading multiple bits results in a relatively long multi-bit phase shifter. As insertion loss is dominated by conductor loss, these long multi-bit phase shifters become rather lossy reducing advantages that MEMS-based phase shifters may offer. This proposed project seeks to overcome these limitations by maximize phase shift per unit length, while increasing bandwidth, to arrive at a low-loss Ka-band phase shifter with significant performance and size improvements over currently available technologies.

## Primary U.S. Work Locations and Key Partners



High Performance Ka-band  
Phase Shifters for Space  
Telecommunications, Phase I

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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission  
Directorate (STMD)

### Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

### Responsible Program:

Small Business Innovation  
Research/Small Business Tech  
Transfer

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Organizations Performing Work	Role	Type	Location
★ Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
MEMtronics Corporation	Supporting Organization	Industry	Plano, Texas

## Primary U.S. Work Locations

California	Texas
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## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

Chuck Goldsmith

## Technology Areas

**Primary:**

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - └ TX05.2 Radio Frequency
    - └ TX05.2.6 Innovative Antennas